

Practice paper – 2

Topic: Passive Filters

Q1. Find the transfer function $\frac{V_o}{V_s}$ of the RC circuit shown in Figure 1. Express it using $\omega_0 = \frac{1}{RC}$.

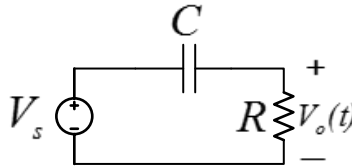


Figure 1

Q2. Design an RL low pass filter that uses a 40-mH coil and has a cutoff frequency of 5 kHz.

Q3. Find the transfer function (V_o/V_i) of the following circuit (Figure 2) and identify the filter type. Find out the cut-off frequency and gain of the filter and draw its frequency response. Now remove the R_L from the circuit and compare the frequency response with the earlier circuit.

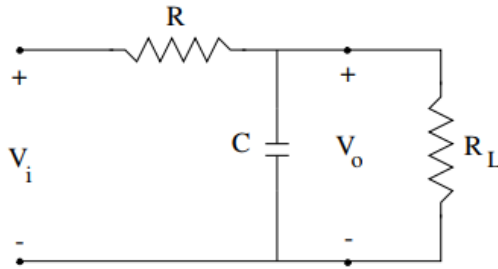


Figure 2

Q4. Design a RLC band pass filter with a lower cut-off frequency of 1 kHz and a bandwidth of 3 kHz. What is the center frequency and Q of this filter?

Q5. For the circuit in Fig. 3, obtain the transfer function. Identify the type of filter the circuit represents and determine the corner frequency. Take $R_1 = 100\Omega = R_2$ and $L = 2\text{mH}$.

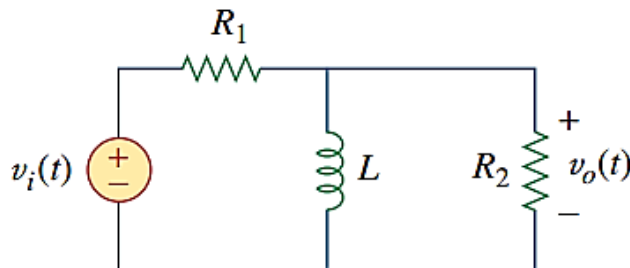


Figure 3

Q6. Find the -3 dB frequency for the following LPF as shown in Figure 4. Find the output voltage at 2 kHz.

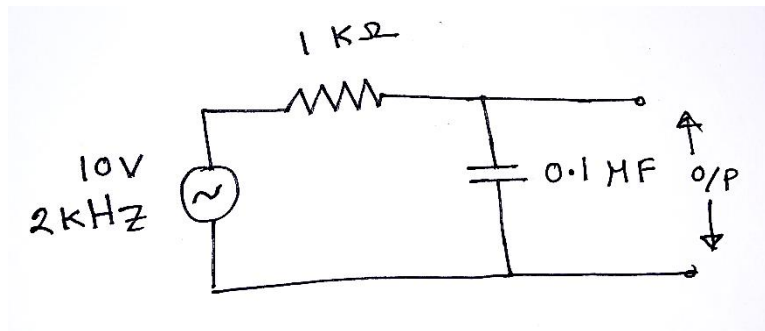


Figure 4

Q7. Find the transfer function of the following circuit (Figure 5). Plot its frequency response comment on the roll-off at -3dB frequency.

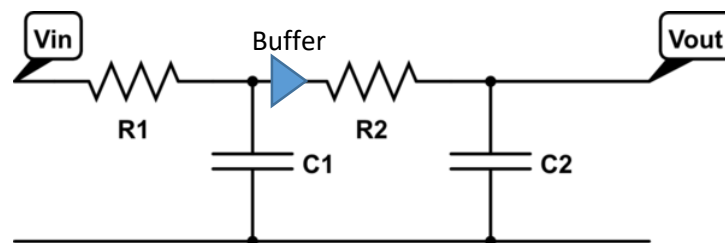


Figure 5